

Community-Centered Post-Impact Assessments: Measuring Social and Livelihood Outcomes of Large Infrastructure Projects in Nigeria

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Abstract

Large infrastructure projects (roads, rail, dams, large water and energy works) reconfigure social and economic life in host communities. While environmental impact assessment (EIA) and ex-ante social impact assessment (SIA) have advanced, there is growing recognition of the need for rigorous, participatory post-impact (ex-post) evaluation that centers community experience and livelihood outcomes. This paper synthesizes the state-of-the-art in SIA and post-project monitoring, proposes a practical, community-centered ex-post assessment framework tailored for Nigerian contexts, and outlines methods to measure social and livelihood outcomes with credible attribution. The framework draws on sustainable livelihoods thinking (five capital assets), participatory methods, mixed-methods integration principles, and spatial econometric approaches for causal inference (including spatial DiD and models that allow spillovers). Practical measurement protocols are provided: stakeholder mapping, baseline reconstruction or synthetic controls, household surveys with livelihood indices, participatory wealth ranking, key informant interviews (KIIs), focus group discussions (FGDs), grievance and complaint system analysis, and remote sensing/GIS to capture land-use change. Case illustrations from Nigeria (water/dam projects; transport resettlement) highlight common findings uneven benefits, livelihood disruption, and the centrality of compensation and local procurement to perceived project legitimacy. The paper concludes with concrete recommendations for regulators, donors, and project developers to embed community-centered ex-post SIA in project lifecycles to protect livelihoods and enhance social licence to operate.

Keywords: *post-impact assessment, social impact assessment, livelihoods, community participation, mixed methods.*

1. Introduction

Large infrastructure projects are often framed as engines of growth: roads reduce transport costs, dams provide water and energy, rail systems stimulate commerce. However, the distributional and social consequences of construction, land acquisition, in-migration, and operational phases are less predictable and often inadequately measured after projects are completed (Esteves et al., 2012; Vanclay, 2020). In Nigeria, investments in water infrastructure, rail corridors, and major roads have been substantial in the last two decades, but empirical evidence on long-term social and livelihood outcomes remains patchy (Adeniran et al 2021). Furthermore, resettlement and

compensation arrangements commonly spark grievances and perceptions of broken promises (Atobatele et al., 2024).

Social Impact Assessment (SIA) has matured as a discipline, offering principles and methods to anticipate social consequences and plan mitigation (Vanclay, 2003; Esteves *et al.*, 2012). Yet ex-ante SIA is only one step: ex-post or post-impact assessment (PIA) systematic evaluation of realized outcomes after project operation is essential for learning, accountability, and adaptive management (Dipper et al., 1998). Post-impact work helps answer critical questions: Did the project improve household incomes or employment? Were livelihoods lost or transformed? Which social groups gained or lost? Was compensation effective at restoring living standards?

This article argues that robust post-impact assessments must be community-centered, combining rigorous causal inference with participatory methods that respect local knowledge and priorities. Community-centered ex-post SIA improves validity of measurements, strengthens local legitimacy, and ensures assessments ask the right outcome questions (Becker *et al.*, 2003; Vanclay, 2020). The paper offers: (a) a review of scholarly insights on post-impact and community-based SIA; (b) a detailed, stepwise framework for measuring social and livelihood outcomes in Nigeria; and (c) methodological recommendations that balance attribution rigor with ethical, participatory practice.

2. Literature review: SIA, post-impact evaluation, and livelihoods

Research on social impact assessment (SIA) and post-implementation evaluation has generally advanced along two interconnected directions: first, the refinement of SIA concepts and procedures as a tool integrated across the project lifecycle, and second, the development of more rigorous methods for assessing and attributing social and livelihood impacts. Earlier disciplinary syntheses described SIA primarily as a framework for anticipating and addressing both the positive and negative social consequences of development projects, with Vanclay's widely cited principles stressing human rights, participatory processes, and equity considerations (Vanclay, 2003). Later reviews repositioned SIA not merely as a compliance mechanism but as a comprehensive lifecycle approach that embeds stakeholder engagement and structured plans for managing social impacts (Esteves et al., 2012; Vanclay, 2020).

A recurring concern in the literature is the disconnect between predicted impacts assessed before project implementation and the realities observed afterward. Evaluations of EIA follow-up and post-audit processes highlight poor or uneven implementation: monitoring is frequently incomplete, of low quality, or not applied to inform adaptive decision-making, thereby weakening accountability (Dipper et al., 1998). In response, scholars advocate for institutionalizing systematic, compulsory post-project SIA that explicitly ties monitoring results to enforcement actions and remedial measures (Vanclay, 2020; Dipper et al., 1998). This institutional emphasis on compliance and enforcement stands in contrast to ongoing methodological debates about the most effective ways to evaluate livelihood impacts and determine causal links to project activities.

Livelihood-focused assessment tools—particularly the Sustainable Livelihoods Framework (SLF) and composite livelihood indices—extend evaluation beyond income by incorporating human, social, natural, physical, and financial capital dimensions (Paul et al., 2020; Timire et al., 2023). Such multidimensional approaches are more effective for capturing complex livelihood shifts often seen after major infrastructure projects, where households may simultaneously lose assets yet gain wage employment. At the same time, Cernea's impoverishment risks and reconstruction (IRR) model remains foundational for analyzing displacement and resettlement risks, highlighting

processes such as landlessness, social marginalization, and restricted access to common resources, while also providing guidance for livelihood restoration strategies (Cernea, 2000). In applied settings, SLF-based indices and Cernea's IRR framework serve complementary roles: the SLF approach offers concrete indicators for tracking livelihood assets and changes, whereas the IRR model provides a theoretical structure for explaining the causal pathways through which displacement generates livelihood outcomes.

Methodologically, research practice is increasingly converging on mixed-method designs that integrate quantitative causal inference with qualitative process-tracing. Guidance from Fetters et al. (2013) and O'Cathain et al. (2010) demonstrates how survey-based effect estimates can be complemented by focus group discussions (FGDs) and key informant interviews (KIIs), enabling statistical patterns to be interpreted through local mechanisms. Participatory approaches (Becker et al., 2003) further enhance inclusivity by eliciting community-defined indicators that technical teams may otherwise overlook. Yet, unless carefully combined, participatory approaches can sit uneasily with the rigor demanded by causal attribution.

Causal identification itself remains a central technical hurdle. Quasi-experimental methods such as difference-in-differences (DID) and propensity score matching (PSM) are widely applied, but infrastructure projects frequently produce spatially diffuse and overlapping impacts. Newer spatial econometric extensions—including spatial DID and multiple-treatment spatial DID—offer tools for capturing spillovers and neighborhood effects, thereby strengthening the credibility of causal claims (Bardaka et al., 2019; Qiu & Tong, 2021). These innovations stand in contrast to earlier, more simplified attribution techniques that risk biased or misleading effect estimates when spatial dependence is present.

Empirical research demonstrates divergences in outcomes. Studies of roads, rail, and water infrastructure show heterogeneous impacts: infrastructure can raise regional economic indicators while displacing or disadvantaging particular households (Bardaka *et al.*, 2019; Qiu & Tong, 2021). Empirical work on hydropower displacees and other resettled groups shows that physical asset replacement alone does not guarantee livelihood recovery; asset portfolios and access to nonfarm opportunities matter (Khanal *et al.*, 2024). This evidence reinforces calls for ex-post assessments that are both multidimensional and disaggregated by gender, tenure, and socioeconomic status.

Finally, the literature debates process versus outcome emphasis. Process scholars argue that procedural justice (FPIC, transparent grievance mechanisms, fair valuation) shapes perceptions and long-term legitimacy independent of measured welfare changes (Hanna & Vanclay, 2013). Empirical SIA reviews in Sub-Saharan contexts find that procedural failings are often as consequential as material losses for community relations and social cohesion (Kahangirwe, 2024). Thus, the most robust ex-post approaches combine rigorous causal estimates of livelihood change with detailed process evaluation and participatory validation (Esteves *et al.*, 2012; Fetters *et al.*, 2013).

3. Conceptual framework for community-centered post-impact assessment

A pragmatic conceptual framework that integrates three pillars was proposed

- i. Livelihood Capitals & Outcomes (Who and what): Use the SLF to structure indicators across human (skills, health), social (networks, social capital), natural (land access, resource base), physical (housing, infrastructure), and financial (income, savings) capitals (Timire *et al.*, 2023). Measure both stocks (assets) and flows (income, service access) and coping/adaptive strategies.

ii. Social Process & Institutional Context (How and why): Capture procedural justice, FPIC compliance, grievance mechanisms, local procurement and employment practices, and social cohesion/disruption. Procedural failures often explain why objectively positive economic outcomes nonetheless generate negative community perceptions (Vanclay, 2020).

iii. Attribution & Spatial Dynamics (Causal credibility): Use quasi-experimental or natural-experiment approaches (DID, spatial DID, PSM) where possible, complemented by qualitative process tracing and participatory recall (Bardaka *et al.*, 2019; Qiu & Tong, 2021). Spatial techniques are particularly relevant for infrastructure that generates neighborhood spillovers.

This integrated framework explicitly treats communities as agents and knowledge holders, not passive research subjects. Community validation (via FGDs, community workshops) of findings closes the loop and supports remedial action.

4. Methods

Below is an operational protocol designed to be implementable by universities, donors, or independent auditors. It assumes the project is already operational and seeks to measure realized social/livelihood outcomes 1–5 years after operation begins.

4.1. Preparatory phase (scoping & stakeholder mapping)

i. Define objectives and questions: e.g., “What were the net effects of X project on household incomes, asset portfolios, and access to services for directly affected vs. nearby communities?” (Be explicit about the timeframe and outcomes of interest.)

ii. Stakeholder mapping: Identify PAPs (project affected persons), host communities, local government, contractors, women/youth groups, vulnerable groups. Use a network map and power/interest matrix.

iii. Document review: Collect project EIA/SIA, Resettlement Action Plan (RAP), contracts, procurement records, grievance logs, and baseline surveys (if any). In Nigeria, RAPs (e.g., Lagos Red Rail RAPs) are vital sources for PAP lists and compensation details (Atobatele *et al.*, 2024).

iv. Ethics & permissions: Secure institutional ethics approval; obtain local leaders’ consent and apply principles of confidentiality and FPIC.

4.2. Research design (counterfactuals and mixed methods)

i. Counterfactual strategy: If a pre-project baseline exists, use DID with matched controls. If not, reconstruct baselines using recall modules, archival records, and matching to similar neighboring communities (synthetic baseline). Spatial DID and spatial econometric models help account for spillovers (Bardaka *et al.*, 2019; Qiu & Tong, 2021).

ii. Mixed-methods design: Use convergent mixed methods simultaneously collect quantitative household surveys and qualitative data (FGDs, KIIs). Integrate at analysis and interpretation stages using joint displays and data transformation techniques (Fetters *et al.*, 2013; O’Cathain *et al.*, 2010).

4.3. Sampling & instruments

i. Household survey sampling: Multi-stage stratified sampling: (a) stratify communities by “directly affected”, “adjacent”, and “control” zones; (b) enumerations within communities; (c)

sample size powered to detect meaningful changes in livelihood indices (use baseline variance estimates if available).

ii. Indicator modules (quantitative survey):

- Demographics & household composition
- Income portfolio & employment (formal/informal)
- Asset ownership (livestock, durable goods, land)
- Food security (e.g., FIES or household hunger scales)
- Access to services (water, electricity, health, schools)
- Migration/in-migration metrics
- Perception and satisfaction with compensation, local procurement, jobs
- Social capital scales (group membership, trust)
- Grievance experience & use of complaint mechanism
- Subjective well-being (standardized life satisfaction items)

iii. Participatory instruments:

- Focus Group Discussions (gender-segregated where appropriate)
- Key Informant Interviews (local leaders, project staff)
- Participatory Wealth Ranking (to validate quantitative classification)
- Timeline and seasonal calendars to reconstruct pre/post project changes

iv. Remote sensing/GIS:

- Land-use/land-cover change analysis to capture lost agricultural land or environmental disruptions; spatial proximity measures for DID.

4.4. Data quality & integration

i. Enumerator training and piloting: Local enumerators trained in language, ethics, and standardized measures; pilot instruments in analogous communities.

ii. Data management: Use digital data collection (ODK/KoBo) for speed and GPS accuracy. Ensure secure storage.

iii. Integration: Predefine how qualitative data will explain or challenge quantitative patterns (joint displays, narrative threads).

4.5. Analysis strategies

i. Descriptive & comparative analysis: Tabulate livelihood indices across strata (directly affected, adjacent, control).

ii. Causal estimation:

- DID (if baseline exists): estimate treatment effects controlling for covariates.
- Spatial DID / spatial econometrics: model spillovers and neighborhood effects (Bardaka *et al.*, 2019; Qiu & Tong, 2021).
- PSM + DID: when baseline is weak; match households on pre-treatment covariates reconstructed via recall.
- Robustness checks: placebo tests, falsification tests (pre-trend tests), sensitivity to matching calipers.

iii. Qualitative analysis: Thematic coding and process tracing to identify mechanisms (e.g., why compensation failed; social fracture following in-migration).

iv. Composite livelihood index: Use PCA or theoretically weighted indices to create a livelihood score (Paul *et al.*, 2020). Validate index against participatory rankings.

- v. Equity analysis: Disaggregate by gender, age, tenure status (title vs. non-title), and socioeconomic status.
- vi. Synthesis & community validation: Return findings to communities in accessible formats and collect feedback (participatory validation workshops).

5. Indicators

Below is a prioritized, practical indicator set for post-impact SIA focused on livelihoods and social outcomes. Indicators are grouped by capital and measurement approach.

Financial capital which include; Median household income (pre/post recall or baseline), share of households reporting ≥ 1 stable wage job and household savings/credit access

Physical capital which include; Housing condition index (walls/roof/floor), access to piped water/electricity (hours per day) and loss or gain of productive land (ha).

Natural capital which include; Change in area of cultivated land per household (ha) and access to commons/fishing grounds (yes/no)

Human capital which include; School enrolment rates; self-reported health status; vocational training participation

Social capital which include; Membership in associations; trust in local institutions (Likert scale) and incidence of reported social conflict or unrest.

Subjective & process indicators which include; Satisfaction with compensation (Likert), Perception of fairness & transparency and use of grievance mechanism and satisfaction with resolution

Resilience & coping which include; Number/type of coping strategies used during shocks and food consumption score / household hunger. All indicators should be measured both quantitatively (surveys) and contextualized qualitatively.

6. Illustrative application: transport and water projects in Nigeria

Two recurring themes appear in Nigerian project studies: (a) resettlement and compensation challenges in urban transport projects; and (b) uneven benefits from water/reservoir infrastructure.

6.1. Transport/urban rail (Lagos Red Rail example)

Empirical studies of RAP implementation for Lagos's Red Rail show that perceptions of project fairness are closely linked to confidence in government action, literacy, and how RAP promises are delivered (Atobatele *et al.*, 2024). A post-impact assessment that applies the protocol above would compare PAP households' livelihood indices to matched residents in adjacent neighborhoods, analyze grievance logs (timing and resolution), and use FGDs to capture psychosocial impacts of displacement.

6.2. Water infrastructure (dams & standpipes)

Historical review of water infrastructure in Nigeria shows patterns of politicized investment, uneven maintenance, and failures that affect long-term water service delivery (Adeniran *et al.*, 2021). Post-impact assessment here needs to examine not only nominal water access (presence of dam or standpipe) but reliability, operational maintenance, distributional patterns, agricultural water access, and downstream ecological impacts that affect livelihoods.

Across project types, ex-post assessments often find mixed outcomes: infrastructure may increase regional economic activity but produce local losses for some households (loss of land, disrupted informal economies), and benefits may be captured by operators or migrants rather than pre-

existing residents (Bardaka *et al.*, 2019). This heterogeneity underscores the need for disaggregated metrics.

7. Practical challenges and mitigation strategies

- i. Lack of baseline data: Use recall modules carefully, triangulate with RAP/administrative records, and adopt matching and sensitivity analyses to improve credibility. Where possible, construct synthetic controls from similar communities.
- ii. Attribution & spillovers: Spatial econometrics and spatial DID (or multiple control rings) reduce bias from spillovers; include spillover terms explicitly in models (Qiu & Tong, 2021; Bardaka *et al.*, 2019).
- iii. Respondent fatigue & survey burden: Use modular survey design; prioritize core indicators; complement with participatory sessions to cross-validate.
- iv. Political sensitivity: Adopt independent evaluation teams, transparency protocols, and protect respondent anonymity. Community validation reduces adversarial interpretations.
- v. Ethical issues: Respect FPIC, avoid retraumatization of displaced people, ensure grievance mechanisms are accessible, and report findings in ways that support remedial action (Hanna & Vanclay, 2013).

8. Policy implications for Nigeria

- i. Mandate ex-post SIA for major projects: Regulatory agencies should require independent ex-post assessments at 1, 3, and 5 years post-operation, tied to compliance checks and conditional financing.
- ii. Institutionalize community validation: Make community validation workshops part of ex-post protocols; require public disclosure of summary findings and a response plan from project sponsors.
- iii. Use spatial and mixed methods routinely: Governments and donors should adopt spatial DiD and mixed-methods guidance in evaluation protocols to capture both quantitative effects and local meanings (Fetters *et al.*, 2013; Bardaka *et al.*, 2019).
- iv. Strengthen RAPs and link them to livelihoods restoration: Resettlement plans must include livelihood restoration budgets, skills training, local procurement clauses, and independent monitoring.
- v. Data systems and openness: Maintain publicly accessible project portals containing RAPs, grievance logs (anonymised), and ex-post results.

9. Discussion

Community-centered ex-post SIA bridges accountability and learning. Combining the structured measurement of livelihood capitals with participatory voice ensures assessments reflect what communities care about not only GDP gains or headline jobs figures. Empirical and methodological literature converge on three demands: (i) multidimensional livelihood metrics that go beyond income; (ii) causal strategies to credibly tie outcomes to projects while accounting for spatial spillovers; and (iii) participatory engagement that legitimates findings and supports remedial action (Esteves *et al.*, 2012; Timire *et al.*, 2023; Bardaka *et al.*, 2019).

In Nigeria, projects routinely affect complex urban economies and informal livelihoods; ex-post assessment that ignores these complexities risks both overstating benefits and missing harm. The Lagos Red Rail example shows how perceptions can sour when procedures are opaque or promises unfulfilled (Atobatele *et al.*, 2024). Conversely, water infrastructure that stays functional and

equitably managed can have broad livelihood payoffs but only if institutional maintenance and access arrangements are sustained (Adeniran *et al.*, 2021).

10. Conclusion

Robust, community-centered post-impact assessments are feasible and essential. They require careful design (counterfactuals, spatial methods), investment in participatory processes, and institutional mandates that connect ex-post learning to remediation and policy change. For Nigeria, embedding the mixed-methods protocol outlined here into regulatory practice and donor requirements will improve the fairness and sustainability of infrastructure development and protect the livelihoods of the most vulnerable.

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